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FOREST INSECT INVESTIGATIONS

TREE INJECTION AS A CONTROL OF THE MOUNTAIN PINE BEETLE IN WESTERN WHITE PINE

1937 Injections

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1937 Injections

The main objectives of the 1937 injection work in western white pine were: (1) To ascertain the minimum effective dosage of copper sulfate and water, (2) to ascertain the effect of depth of saw-kerf on the distribution of the poison, (3) to determine the rate of distribution and the path of the chemical up the stem, (4) to compare the effect of heavy dosages with the results from lighter dosages during the 1937 season.

A total of 160 trees were injected during the month of September, and at the time of injection complete tree data were taken as in previous years. All trees were located earlier in the season by a spotter who cruised the area periodically and was thus able to record the date of attack for each tree.

As complete mortality does not occur until the spring following injection, these trees will not be examined until June 1938. In the following paragraphs, however, each test will be discussed briefly to show the reason for the test and the number of trees injected.

Dosage

The injection work in western white pine has been conducted primarily to develop an effective method of mountain pine beetle control which is cheaper and less dangerous (from the fire prevention standpoint) than decking and burning the infested trees. The injection

of trees with chemicals offers a possible solution to this problem, and since this method eliminates the fire danger element completely the white pine work has attempted mainly to lower the cost and increase the effectiveness of chemical control.

In the white pine type it is necessary to control mountain pine beetle infestations which are spread over large areas. Obviously many of the trees will be a mile or more from water and trails, and since the nature of terrain and ground debris precludes the use of pack animals in many places, it is thus necessary to transport the injection on the backs of the injection crew. Needless to say, the lighter and less bulky the load the greater will be the production by the treaters.

To this end 150 infested trees were injected with three different amounts of copper sulfate in two different concentrations in order to find the minimum effective dosage. The amount of copper sulfate injected was based on tree diameter, being injected at the rate of one ounce, one-half ounce, and one-quarter ounce per inch diameter. These dosages were injected as both 50 and 25 percent solutions so that each group was represented by 25 trees as shown in table I.

Table I

$CuSO_4$ per inch d.b.h.	Percent solution	Number trees injected
One	50	25
	25	25
One-half	50	25
	25	25
One-quarter	50	25
	25	25

The dosage of one-half ounce per inch diameter injected in a 25-percent solution represents the one which gave such successful results in 1935.

In addition to these 150 trees, 10 additional trees were injected with the so-called "commercial wood-preservation dosage" of one-half pound of copper sulfate per cubic foot of wood, considering only the outer half inch of wood. This dosage was injected in a concentrated solution. These trees were injected for the purpose of comparing the lighter with the heavier dosages during the same season.

During the 1936 work all trees were injected with the heavier dosages and yielded only fair mortality because of the crystallization of the poison and resultant blocking of the tracheids as a result of the slow ascension of a concentrated solution as pointed out in the 1936 report. Because of the poorer results and excessive weight of water and poison needed for the heavier dosages, they were abandoned in the white pine work.

Depth of Saw-kerf

Previous reports have mentioned that there is slower ascension and poorer distribution of the poison as well as less mortality in trees which have been attacked for a period of time greater than 60 days, because of the blocking of conducting tissue by blue stain hyphae. Although not definitely proved, there are indications that in these

trees the copper sulfate ascends in the older, less-blued sapwood and is finally distributed radially to the wood surface where possible.

It was thought that by making a deeper saw-kerf in these older-attacked trees distribution might be facilitated and mortality improved. It was also thought that a deep saw-kerf in younger-attacked trees might be detrimental in that it would tend to cause the heaviest concentration of poison deeper in the tree rather than at the wood surface where needed. Hence, the trees in this test were divided into two groups: (1) Trees which had been attacked less than thirty days and (2) trees which had been attacked for more than fifty days. Ten trees were included in each group and injected by means of a deep saw-kerf. An equal number of trees representative of each group and injected by means of a shallow kerf have been selected from the regular dosage trees.

Distribution of $CuSo_4$

In conjunction with the above study of saw-kerf depth, more detailed information was desired on the rate of distribution and the path of the chemical up the tree in trees which had been attacked for different periods of time. Owing to the height attained by western white pine and the desire not to mark the xylem by using climbers, it was necessary to rig the trees with block and tackle so that a man could be raised to make periodic examinations at various heights along the bole. Hence, because of the amount of tackle needed and the time consumed in rigging the trees, only four 12-inch diameter trees were

selected for this study. These small trees enabled us to sample every ten feet to the crown of the tree, a distance of 60 feet. These trees represent the following conditions: Green tree, 25-day old attack, 45-day old attack, and 65-day old attack. Wood samples were taken with an increment borer and tested with a one-tenth normal solution of potassium ferrocyanide.

Although some results are already apparent from this study, final examination will not be made until June 1938, at which time all results will be reported.

Tools and Materials

Two changes were made during the 1937 injection studies. In place of the straight-edged, heavy docking saw formerly used to make the saw cuts, it was found that a light, curved-edged pruning saw was much more satisfactory both from the standpoint of weight and ease in handling. The curved saw was particularly advantageous with deeply convoluted trees.

The turpentine hack sent out to be used in making the break in the conducting tissue for ingress of the solution was returned because it had proved unsatisfactory for the following reasons: (1) Excessive weight, (2) time consumed in making cut level around large trees, (3) width of cut too wide compared with depth of solution in collar. A different style hack with a narrower cutting surface and a longer weighted

pipe handle was developed and used by the California Forest Experiment Station in their heptane studies. This hack was much more satisfactory for use with large trees owing to the fact that it did not rub the user's hand against the bark as does the shorter hack with the weighted end.

In addition to the change in the type of saw, it was found that the "crepe-craft" paper, used by the Dutch Elm Disease Laboratory, made an excellent material for collars. This material is satisfactory providing the dosages are light. If an attempt is made to use the paper with the commercial dosages, the larger volume and weight stretches the paper to such an extent that the tar filler is broken, thus causing leaks.

Samples of an "Osmose Creped and Corrugated Covering Paper" were secured from the Osmose Corporation of America, Buffalo, New York, which could be secured in large quantities. This paper is practically the same as the "crepe-craft" mentioned above, would cost only about four cents per tree, and is very light in weight.

Respectfully submitted,

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